October 2012

R122H, R222, R232A, and R232E Series Instruction Manual

WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

Fisher® equipment must be installed, operated, and maintained in accordance with federal, state, and local codes and Fisher instructions. The installation in most states must also comply with NFPA No. 54 and 58 standards.

Only personnel trained in the proper procedures, codes, standards, and regulations of the LP-Gas industry should install and service this equipment.

Things to tell the gas customer:

1. Show the customer the vent or vent assembly or vent tube. Stress that this opening must remain unobstructed at all times. Tell the customer to check the vent opening after a freezing rain, sleet storm, or snow to make sure ice has not formed in the vent.
2. Show the customer the shutoff valve on the container. The customer should close this valve immediately if gas is smelled, appliance pilot lights fail to stay on or appear higher than usual or any other abnormal situation occurs.
3. Tell the customer to call your company to service the regulator if the regulator vents gas or a leak develops in the system. Only a qualified gas service person should install or service the regulator.

Introduction

Scope of the Manual

This Instruction Manual covers installation and maintenance for the R122H, R222, R232A, and R232E Series regulators, which includes first stage, second stage, integral two-stage, and integral two psig service regulators used on LP-Gas vapor service applications. They are not to be used on liquid service.

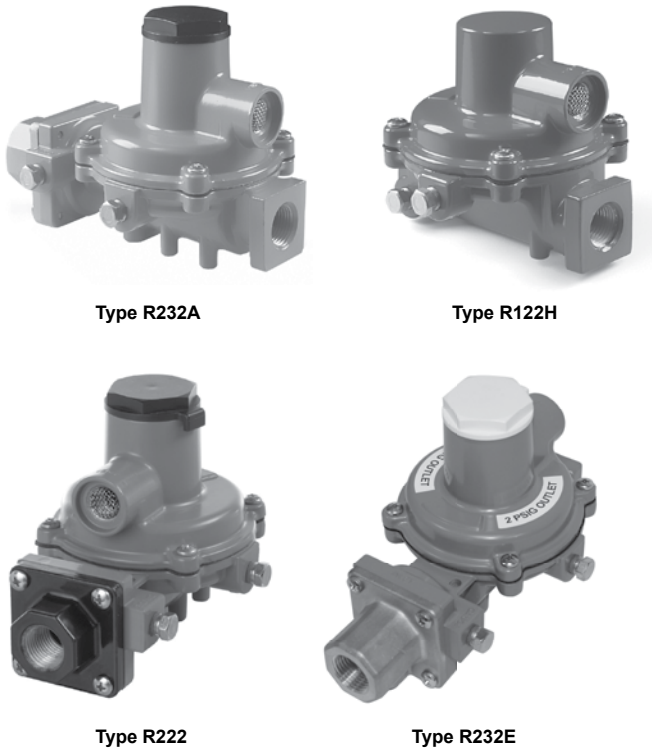

Figure 1. *R122H, R222, R232A, and R232E Series Regulators*

Description

Second Stage Low Pressure Regulator

The Type R222 second stage regulator provides low pressure, inches of water column, delivery pressure. It is set at 11-inches w.c. / 27 mbar pressure and comes with a high capacity internal relief valve. The regulator is painted PALM GREEN.

D450141T012

Specifications

Specifications and Tables 1 and 2 list the specifications for these regulators. Contact the factory if the regulator is to be used on any service other than LP-Gas, natural gas, or air. The following information is located on the spring case: type number, orifice size, spring range, and date of manufacture.

Pressure Taps Size Restriction
1/8 NPT: #54 / 0.055-inch Drill on outlet and inlet

Orifice Sizes
R122H Series: 0.15-inch / 3.8 mm
R222 Series: 0.14-inch / 3.6 mm
R232A and R232E Series: 0.193-inch / 4.9 mm

Wide Open C_g for Relief Sizing
R122H Series: 23
R222 Series: 18
R232A and R232E Series: 19

Maximum Allowable Inlet Pressure
R122H, R232A, and R232E Series: 250 psig / 17.2 bar
R222 Series: 10 psi / 0.69 bar

Maximum Emergency Inlet Pressure
R122H, R232A, and R232E Series: 250 psig / 17.2 bar
R222 Series(1): 75 psi / 5.2 bar when used with a Fisher® Type R122H or R622H first stage regulator. 40 psi / 2.8 bar when used with any other first stage regulator.

Temperature Capabilities
R122H, R222, R232A, and R232E Series: -20 to 160°F / -29 to 71°C(2)

Pressure Registration
Internal

Outlet Pressure Standard Setpoint
R122H Series: 10 psi / 0.69 bar
R222 Series: *Second Stage:* 11-inches w.c. / 27 mbar
R232A Series: *First Stage:* approximately 9 psig / 0.62 bar at 100 psig / 6.9 bar, 50 SCFH / 1.42 Nm^3/h
Second Stage: 11-inches w.c. / 27 mbar
R232E Series: 9 psig / 0.62 bar at 100 psig / 6.9 bar, 50 SCFH / 1.42 Nm^3/h
Second Stage: 2 psig / 0.14 bar

Outlet Pressure Spring Ranges
R122H Series: 10 psig / 0.69 bar +/- 1 psig / 0.07 bar (non-adjustable)
R222 Series: *Second Stage:* 9.5 to 13-inches w.c. / 24 to 32 mbar
R232A Series: *First Stage:* non-adjustable
Second Stage: 10.2 to 13-inches w.c. / 25 to 32 mbar
R232E Series: *First Stage:* non-adjustable
Second Stage: 1 to 2.2 psig / 0.07 to 0.15 bar

Approximate Weights
R122H Series: 1.2 lbs / 544 grams
R222 Series: 1.4 lbs / 635 grams
R232A and R232E Series with POL: 1.9 lbs / 865 grams
R232A and R232E Series with NPT fitting: 1.5 lbs / 671 grams

1. In the event the R222 Series malfunctions during a Maximum Emergency Inlet Pressure condition these inlet pressures and the R222 Series relief performance will limit downstream pressure to 2 psi / 0.14 bar or less.
2. Product has passed Fisher testing for lockup, relief start-to-discharge and reseal down to -40ºF / -40ºC.

Integral Two-stage Regulator

The Type R232A integral two-stage regulator contains a non-adjustable first stage regulator on the inlet. The second stage provides 11-inches w.c. / 27 mbar outlet pressure. The second stage portion has a high capacity internal relief valve construction. The first stage does not have an internal relief valve. The regulators are painted GRAY with a BLACK CAP.

Integral Two psig Service Regulator

The Type R232E integral two psig service regulator contains a non-adjustable first stage regulator on the inlet. The second stage provides 2 psig / 0.14 bar outlet pressure. The second stage portion has a high capacity internal relief valve construction. The first stage does not have an internal relief valve. The regulators are painted GRAY with a WHITE CAP.

First Stage Regulators

Type R122H regulators are designed for high pressure (pounds per square inch) vapor service. These regulators have high capacity internal relief valves.

When used on first stage service, the Type R122H regulator reduces container pressure to approximately 10 psig / 0.69 bar inlet pressure to a second stage regulator. On final stage service the regulator reduces container pressure for a high pressure burner. The regulator is painted RED.

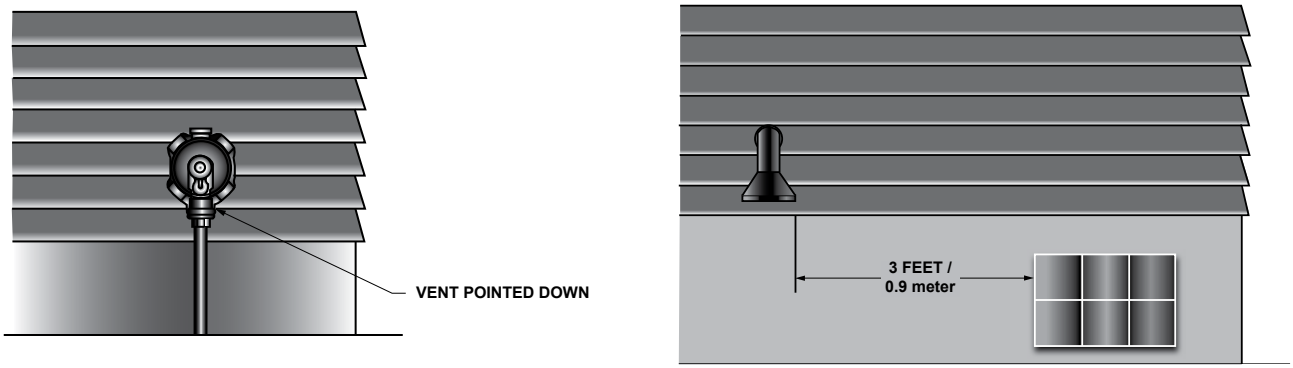

Figure 2. *Regulator with Vent Pointed Down*

Table 1. *Relief Valve Specifications*

TYPE	TYPICAL SETPOINT		NOMINAL RELIEF VALVE START-TO-DISCHARGE		MAXIMUM OUTLET PRESSURE WITH DISC REMOVED			
					Inlet Pressure		Maximum Outlet Pressure	
	psi	bar	psi	bar	psig	bar	psig	bar
R122H	10	0.69	16	1.10	250	17.2	Not Applicable	
R222	11 inches w.c.	27 mbar	1	0.07	30	2.07	2.0	0.14
R232A[1]	11 inches w.c.	27 mbar	1	0.07	250	17.2	2.0	0.14
R232E[1]	2	0.14	3.5	0.24			5.0	0.34

1. For integral two-stage regulators, the second stage disc is removed.

Table 2. *Capacity, Connection Sizes, and Vent Orientation*

REGULATOR APPLICATION	TYPE NUMBER	CAPACITY BTU/HR PROPANE[1]	INLET CONNECTION	OUTLET CONNECTION	OUTLET PRESSURE SETTING	3/8-INCH FNPT SCREENED VENT STANDARD LOCATION
First Stage	R122H-AAJ	1,100,000	1/4-inch FNPT	1/2-inch FNPT	10 psig / 0.69 bar	Over Outlet[2]
Second Stage	R222-BAF	650,000	1/2-inch FNPT	1/2-inch FNPT	11-inches w.c. / 27 mbar	Over Inlet
	R222-BAFXA					Over Outlet
Integral Two-Stage	R232A-BBF	550,000	1/4-inch FNPT	1/2-inch FNPT		First Stage[3]: Down Second Stage: Over Outlet
	R232A-HBF		FPOL			
	R232A-BBFXA	550,000	1/4-inch FNPT	1/2-inch FNPT		First Stage: Opposite Gauge Taps Second Stage: Opposite Gauge Taps
	R232A-HBFXA		FPOL			
Integral Two psig Service	R232E-BBH	500,000	1/4-inch FNPT	1/2-inch FNPT	2 psig / 0.14 bar	First Stage[3]: Down Second Stage: Over Outlet
	R232E-HBH		FPOL			

1. Capacities Based on:
   Second Stage: 10 psig / 0.69 bar with 2-inches w.c. / 5 mbar droop.
   Integral Two Stage: 30 psig / 2.07 bar and 2-inches w.c. / 5 mbar droop.
   Integral Two psig Service Regulator: 30 psig / 2.07 bar inlet pressure and 20% droop.
   First Stage: 30 psig / 2.07 bar inlet pressure and 20% droop.
2. Also available with vent opposite gauge taps.
3. Integral First Stage Vent size: 7/16-24 UN thread for 1/4-inch OD copper tube inverted flare fitting.

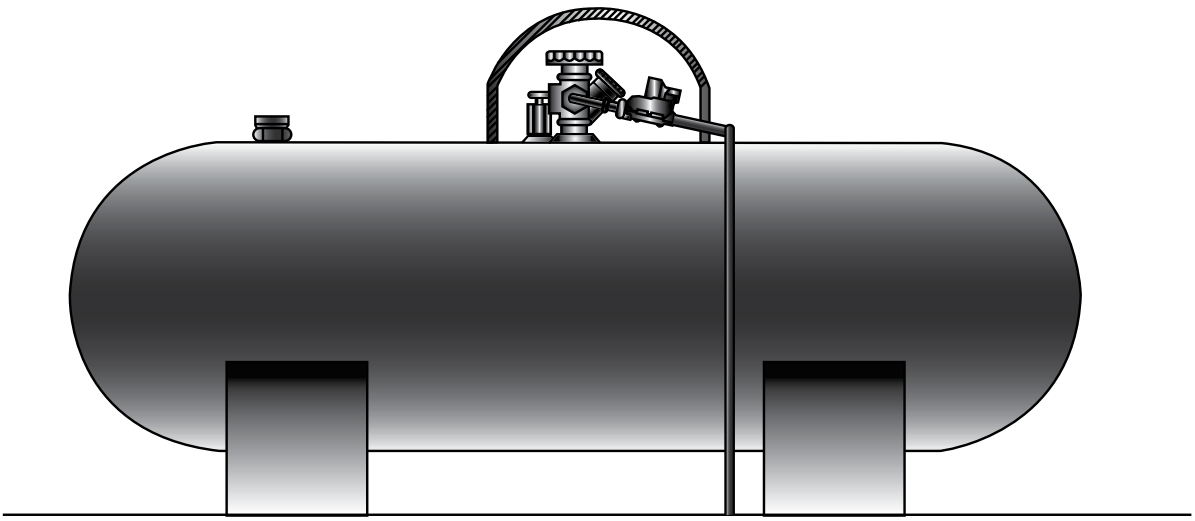

Figure 3. *Tank Installation*

Installation

WARNING

All vents should be kept open to permit free flow of air in and out of the regulator. Protect vent openings against the entrance of rain, snow, ice formation, paint, mud, insects, or any other foreign material that could plug the vent or vent line.

LP-Gas may discharge to the atmosphere through the vent. An obstructed vent which limits air or gas flow can cause abnormally high pressure that could result in personal injury or property damage.

The Types R232A, R232E, and R122H are not suitable for indoor installations. Never use the Types R122H and R232E (pounds to pounds) regulators on low pressure (inches of water column) service because personal injury or property damage could occur.

General Installation Instructions

Before installing the regulator,

- Check for damage, which might have occurred in shipment.
- Check for and remove any dirt or foreign material, which may have accumulated in the regulator body.
- Replace old pigtails. Blow out any debris, dirt or copper sulfate in the copper tubing and the pipeline.
- Apply pipe compound to the male threads of the pipe before installing the regulator.
- Make sure gas flow through the regulator is in the same direction as the arrow on the body. “Inlet” and “Outlet” connections are clearly marked.

Installation Location

- The installed regulator should be adequately protected from vehicular traffic and damage from other external sources.
- Install the regulator with the vent pointed vertically down, see Figure 2. If the vent cannot be installed in a vertically down position, the regulator must be installed under a separate protective cover. Installing the regulator with the vent down allows condensation to drain, minimizes the entry of water or other debris from entering the vent, and minimizes vent blockage from freezing precipitation.
- Do not install the regulator in a location where there can be excessive water accumulation or ice formation, such as directly beneath a down spout, gutter, or roof line of building. Even a protective hood may not provide adequate protection in these instances.
- Install the regulator so that any gas discharge through the vent or vent assembly is over 3 feet / 0.9 meters horizontally from any building opening below the level of discharge.
- Install the regulator high enough above ground level - at least 18 inches / 46 cm - so that rain splatter cannot freeze in the vent.

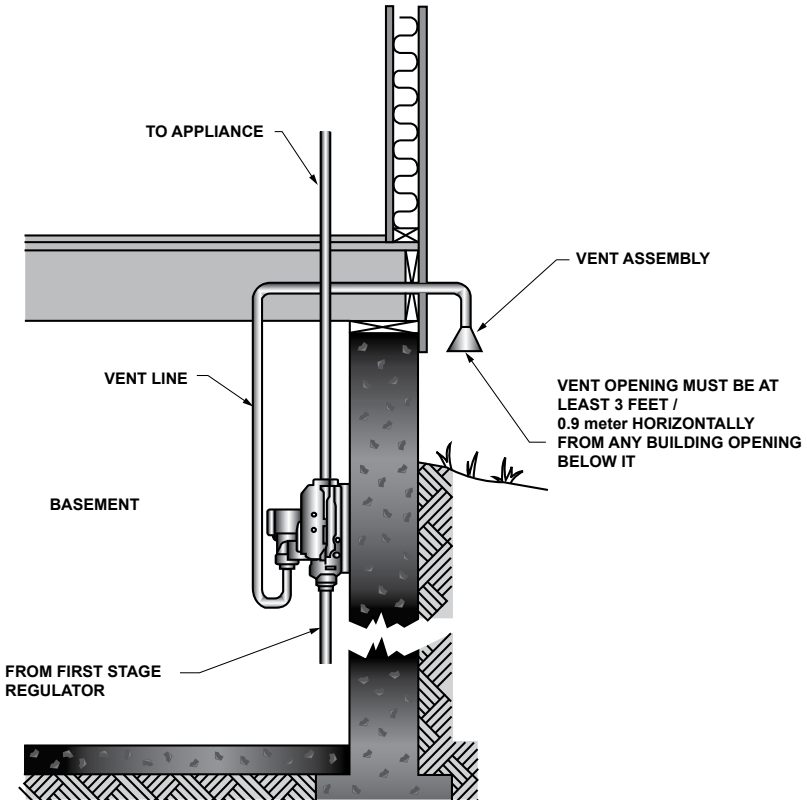
TO APPLIANCE
VENT ASSEMBLY
VENT LINE
VENT OPENING MUST BE AT LEAST 3 FEET / 0.9 meter HORIZONTALLY FROM ANY BUILDING OPENING BELOW IT
BASEMENT
FROM FIRST STAGE REGULATOR

Figure 4. *Basement Installation*

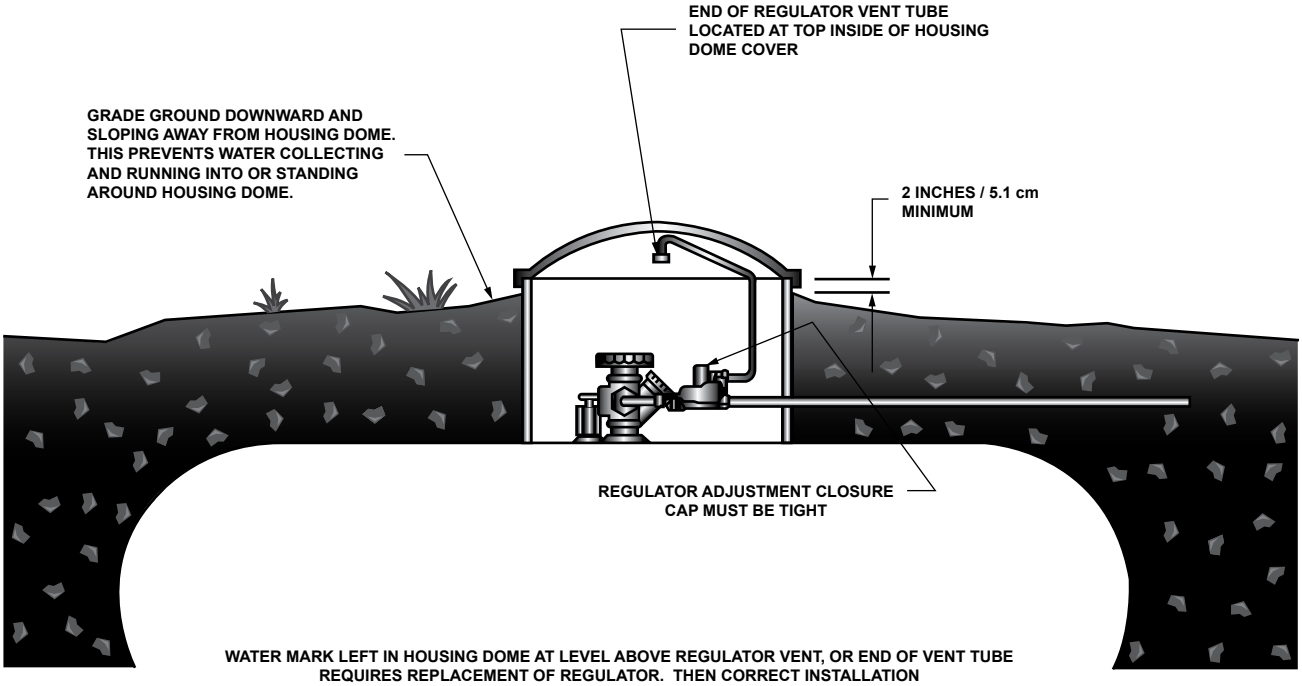
END OF REGULATOR VENT TUBE LOCATED AT TOP INSIDE OF HOUSING DOME COVER
GRADE GROUND DOWNWARD AND SLOPING AWAY FROM HOUSING DOME. THIS PREVENTS WATER COLLECTING AND RUNNING INTO OR STANDING AROUND HOUSING DOME.
2 INCHES / 5.1 cm MINIMUM
REGULATOR ADJUSTMENT CLOSURE CAP MUST BE TIGHT
WATER MARK LEFT IN HOUSING DOME AT LEVEL ABOVE REGULATOR VENT, OR END OF VENT TUBE REQUIRES REPLACEMENT OF REGULATOR. THEN CORRECT INSTALLATION

Figure 5. *Underground Installation*

Regulators Subjected to Heavy Snow Conditions

Some installations, such as in areas with heavy snowfall, may require a hood or enclosure to protect the regulator from snow load and vent freeze over.

Horizontally Installed Regulators

Horizontally mounted regulators, such as found in single cylinder installations and ASME tanks, must be installed beneath a protective cover or under the ASME tank dome, refer to Figure 3. If possible, slope or turn the vent down sufficiently to allow any condensation to drain out of the spring case. Be careful that the slot in the tank dome or protective cover for the regulator's outlet piping does not expose the vent to the elements. The first stage vent on the Types R232A and R232E should be pointed down.

Indoor Installations

The Types R122H, R232A, and R232E regulators are not recommended for indoor installations. The Type R222 regulator may be installed indoors as follows.

By code, regulators installed indoors have limited inlet pressure, and they require a vent line to the outside of the building, see Figure 4. A vent assembly, such as Fisher® Y602 Series, should be used on the end of the vent line. The same installation precautions, previously discussed throughout this manual for the regulator vent, apply to the end of the vent tube assembly. Vent lines must not restrict the gas flow from the regulator's internal relief valve. Vent lines should be at least 3/4-inch NPT pipe or 3/4-inch NPT size, Gray PVC Schedule 40 Rigid Non-metallic Electrical Conduit for above Ground Service, per Underwriters Laboratories (UL®) 651. To install the vent line, remove the vent screen and apply a good grade of pipe dope to the male threads of the line. Vent lines should be as straight as possible with a minimum number of bends.

Underground Installations

WARNING

Types R232A and R232E integral regulators require 2 vent tubes, one on the first stage vent and one on the second stage vent, when installed on underground tanks. Failure to use 2 separate vent tubes can result in early regulator failure and/or over pressuring the second stage that could result in fires or personal injury.

A regulator installed in the dome of an underground container requires a vent tube to prevent water from entering the regulator spring case, see Figure 5.

The Type R122H will require one vent line and if the Types R232A and R232E integral regulators is installed on an underground tank the use of 2 vent tubes are required, one for the first stage vent (1/4-inch OD copper tube inverted flare connection: 7/16-24 UN thread) and the other for the second stage vent (3/8 NPT) of the regulator, are required.

Remove the vent screen(s) and install a vent tube(s). The vent tube must be run from the regulator vent(s) to above the maximum water table. The vent tube opening(s) must terminate at the extreme top inside of the dome cover. Make sure the regulator's closing cap is on tightly, and maintain drainage away from the dome at all times.

Adjustment

Each regulator is factory set. If it becomes necessary to increase the outlet pressure, remove the closing cap and turn the adjustment screw clockwise. Turn the adjusting screw counterclockwise to decrease the outlet pressure. The first stage portion of the Types R232A and R232E integral regulators is non-adjustable.

The inlet and outlet pressure tap plugs on the R122H, R222, R232A, and R232E Series regulators may be removed using a 7/16-inch / 11 mm hexagon wrench. The pressure tap is restricted, so the plug can be removed with pressure in the regulator. Install a pressure gauge to determine the regulator's inlet pressure and outlet setting during adjustment, (Actual pressure at the second stage regulator may be less due to line loss.). After setting, add thread sealant to the pipe plug and reinstall it. Replace the closing cap. Check the plug for leakage.

Overpressure Protection

WARNING

Some type of overpressure protection is needed if actual inlet pressure can exceed the outlet pressure rating. Overpressuring any portion of this equipment above the limits shown in the Specifications may cause damage to regulator parts, leaks in the regulator, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

If any portion of the regulator is exposed to an overpressure condition that exceeds the limits in the Specifications, it must be inspected for damage that may have occurred.

Large volumes of gas may discharge through the regulator vent during internal relief valve operation, which can, if not controlled, result in fire or explosion from accumulated gas.

The R222, R232A, R232E, and R122H Series regulators, except for the first stage of the Types R232A and R232E, contain internal relief valves. The internal relief valve in all units will give overpressure protection against excessive build-up resulting from seat leakage due to worn parts or chips or foreign material on the orifice. The amount of internal relief protection provided varies with the regulator type and the cause for the overpressure relief valve operation, see Table 1. When the internal relief valve opens, gas escapes to the atmosphere through the regulator's vent.

Some type of additional external overpressure protection must be provided if the outlet pressure in an overpressure condition exceeds the inlet pressure rating of the gas system or downstream equipment. Common methods of external overpressure protection include relief valves, monitoring regulators, shutoff devices, and series regulation.

Maintenance

WARNING

To avoid personal injury or equipment damage, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure.

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by Fisher® should be used for repairing Fisher regulators. Relight pilot lights according to normal startup procedures.

Due to normal wear or damage that may occur from external sources, these regulators must be inspected and maintained periodically. The frequency of inspection and replacement of the regulators depends upon the severity of service conditions or the requirements of local, state, and federal regulations. Even under ideal conditions, these regulators should be replaced after 20 years from date of manufacture or sooner should inspection reveal the need.

Visually inspect the regulator each time a gas delivery is made for:

- Improper installation, vent not pointed vertically down or under a cover; no vent tube on underground systems.
- Plugged or frozen vent.
- Wrong regulator or no regulator in the system.
- Internal or external corrosion.
- Flooded Regulator; water in spring case; regulator submersed on underground tanks
- Regulator age.
- Any other condition that could cause the uncontrolled escape of gas.

Failure to do the above could result in personal injury or property damage.

Vent Opening

Make sure the regulator vent, vent assembly, or vent tube does not become plugged by mud, insects, ice, snow, paint, etc. The vent screen aids in keeping the vent from becoming plugged, and the screen should be clean and properly installed.

Water inside Regulators from Floods, Weather, or Water Table on Underground Systems

Replace any regulator that has been flooded or has been submersed below the water table of an underground tank, has had water in the spring case or show evidence of external or internal corrosion. Checking for internal corrosion on the Types R222, R232A, and R232E second stage portion can be done by removing the closing cap and with the aid of a flashlight observing the condition of the relief valve spring, main spring, and internal spring barrel area. A more detailed examination will require shutting down the gas system and the complete removal of the adjusting screw. The Type R122H regulator must be completely disassembled by a qualified person to look for internal

corrosion. Closely examine regulators installed with their vent horizontal for signs of corrosion. Correct any improper installations.

Regulator Replacement

Older regulators are more likely to catastrophically fail because of worn or corroded parts. Replace R222, R232A, R232E, and R122H Series regulators over 20 years of age. Other service or environmental conditions may dictate replacement of the regulator before it becomes 20 years old. Regulators that are installed on underground systems and in areas that are subject to sea salt (coastal) atmospheres should be inspected annually for external and internal corrosion and may require replacement sooner. Refer to Fisher® Bulletin LP-32 for additional information.

Regulator Repair

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by Fisher should be used to repair Fisher regulators. Be sure to give the complete type number of the regulator when corresponding with the factory.

The type number, orifice size, and spring range are on a label attached to the spring barrel. The date of manufacture is stamped on the regulator. Always provide this information in any correspondence with your Fisher Distributor regarding replacement parts or technical assistance. If construction changes are made in the field, be sure that the regulator marking is also changed to reflect the most recent construction.

LP-Gas Equipment

Emerson Process Management
Regulator Technologies, Inc.

USA - Headquarters
McKinney, Texas 75069-1872, USA
Tel: +1 800 558 5853
Outside U.S. +1 972 548 3574

For further information visit www.fisherregulators.com

The Emerson logo is a trademark and service mark of Emerson Electric Co. All other marks are the property of their prospective owners. Fisher is a mark owned by Fisher Controls International LLC, a business of Emerson Process Management.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson Process Management Regulator Technologies, Inc. does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Emerson Process Management Regulator Technologies, Inc. product remains solely with the purchaser.

EMERSON™
Process Management

©Emerson Process Management Regulator Technologies, Inc., 2005, 2012; All Rights Reserved